

## Remarks

Claims 28 - 53 are pending. Favorable reconsideration is respectfully requested.

Claim 28 has been "objected to." The "l" in "Cl" is the letter (small case) "L". The CG Times font does not use a separate symbol for the letter "l" and the numeral "1". The distinction is based on usage and context, and one skilled in the art immediately recognizes that "Cl" is the symbol for chlorine. To "correct" this, the entire specification and claims would have to be retyped in another font. Most common fonts do not distinguish between "l" (the letter) and "1" (the numeral). Withdrawal of the objection to claim 2 is respectfully solicited.

The objection to claim 34 is not understood, as this claim does not refer to silicon tetrafluoride. If claim 31 was intended, it is noted that claim 28 does not limit the halosilane to be a chloro-, bromo-, or iodo-silane, but includes fluorosilanes as well. The claim limits the silanes to Cl-, Br- or I-silanes while also requiring apolar solvents.

The restriction (lack of unity) rejection is traversed, as there is a common corresponding technical feature, actually two: that of preparing amorphous silicon particles, and the use of apolar solvent when the halosilane is a Cl-, Br-, or I-silane. Contrary to the opinion of the Office, WO/01/15250 does not teach or suggest either of these corresponding special technical features, as per the discussion below. Under the PCT rules, the lack of unity "restriction" must be withdrawn.

Claims 28 - 29, 34 - 36, and 39 have been rejected under 35 U.S.C. §102(b) over Harwell WO/01/14250 ("WO '250"). Applicants respectfully traverse this rejection.

*WO '250 does not teach the preparation of amorphous silicon. Rather, WO '250 teaches preparation of "silicon nanoparticles," in other words, silicon-containing nanoparticles. Note in particular page 14, line 23 "silicon-based nanoparticles", and lines 31 - 32 ("Si[-*

centered]) and metal-centered Si nanoparticles. Note also the discussion at page 16, last paragraph.

The process of *WO '250* is reduction of tetrachlorosilane in a polar solvent. The preferred polar solvents are (page 18) tetrahydrofuran, diethyl ether, triglyme, and tetraglyme. As a result of reduction in these polar, coordinating solvents, the products are  $\text{Si}_{20}\text{Cl}_{20}$  (silicon monochloride cluster) or  $\text{Si}_{20}(\text{OH})_{20}$  (silicon hydroxide cluster), not amorphous elemental silicon. *See, e.g.* page 17, lines 8 - 16. The  $\text{Si}_{20}\text{Cl}_{20}$  clusters may be hydrolyzed to  $\text{Si}_{20}(\text{OH})_{20}$  clusters by adding water (page 19, last paragraph).

A polar coordinating solvent is required by *WO '250*. While *WO '250* does teach the use of apolar solvents, it does so only in the presence of the required polar solvent. Note claim 13, for example, and lines 29 - 32 of page 18, where hexane (an apolar solvent) is taught to be used with diglyme (a polar coordinating solvent).

The requirements for anticipation under the law is one of "strict identity". *Trintec Industries Inc. v. TOP-USA Corporation*, 295 F.3d 1292 (Fed. Cir. 2002), and for this reason, cases of anticipation, as stated by the *Trintec* Court, are "quite rare." Moreover, a reference is only good for what it "clearly and definitely discloses" to one skilled in the art. *In re Hughes* 145 USPQ 467, 471 (CCPA 1965), and any uncertainty in a reference's teachings must be resolved in favor of applicants. *In re Sheppard*, 144 USPQ 42 (CCPA 1964). Here, one skilled in the art would clearly not view *WO '250* as teaching the preparation of amorphous silicon, i.e. particles which are composed exclusively of silicon metal (along with trace impurities), but rather would interpret *WO '250* as disclosing amorphous silicon-containing particles of predominantly  $\text{Si}_{20}\text{Cl}_{20}$  or  $\text{Si}_{20}(\text{OH})_{20}$ . These may be amorphous, but are not amorphous silicon. They are silicon compounds. One skilled in the art would also interpret *WO '250* as requiring a polar solvent, with apolar solvents being used only in conjunction with a polar solvent. This is the only reasonable interpretation of *WO '250*, and that interpretation clearly does not meet the "strict identity" requirement for anticipation. *See also* page 7, first full paragraph, of the present specification, which clearly indicates that the process of *WO '250*, employing a polar solvent,

does not produce pure amorphous silicon. Withdrawal of the rejections of the claims under 35 U.S.C. § 102(b) over *WO '250* is respectfully solicited.

Claims 28, 30 - 33, 37 - 38 and 40 have been rejected under 35 U.S.C. § 103(a) over Häyhä U.S. Patent 4,756,896 ("US '896") in view of *WO '250*. Applicant fails to find any motivation to combine these references, and even if combined, the resulting combination does not teach or suggest the claimed invention.

The requirements necessary to combine references are very strict. In the case of *In re Anita Dembiczak and Benson Zinbarg*, 50 U.S.P.Q.2d 1614 (Fed. Cir. 1999), the CAFC has indicated that the requirement for showing the teaching or motivation to combine references is "rigorous." *Dembiczak* at 1617. Moreover, this showing, which is rigorously required, must be "clear and particular." *Dembiczak* at 1617. See also, *C.R. Bard v. M3 Sys., Inc.*, 48 U.S.P.Q.2d 1225, 1232 (Fed. Cir. 1998). It is well established that merely because references can be combined, the mere suitability for logical combination does not provide motivation for the combination. See, *Berghauser v. Dann, Comr. Pats.*, 204 U.S.P.Q. 398 (DCDC 1979); *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 221 U.S.P.Q. 929 (Fed. Cir. 1984). Moreover, mere conclusory statements supporting the proposed combination, standing alone are not "evidence". *McElmurry v. Arkansas Power & Light Co.*, 27 U.S.P.Q.2d 1129, 1131 (Fed. Cir. 1993). See also, *In re Lee*, 61 U.S.P.Q. 2d 1430 (Fed. Cir. 2002).

Moreover, when combinations of references are made, it is improper to only "pick and choose" just so much from a given reference to support a rejection. Rather, all the salient features of the reference must be used in the combination as well. *In re Wesslau*, 147 USPQ 391, 393 (CCPA 1965).

Here, there is no motivation to combine *WO '250* with *US '896*. *WO '250* employs a low boiling polar solvent in its reaction to form silicon-containing clusters of  $\text{Si}_{20}\text{Cl}_{20}$  or  $\text{Si}_{20}(\text{OH})_{20}$ . *US '896*, to the contrary, does not use a low boiling polar solvent, but a high boiling

non-polar solvent. These are opposite requirements which would motivate against combination. *WO '250* teaches that even diglyme (b.p. 216°C) and triglyme (b.p. 276°C) are already difficult to work with due to the difficulty of removing these higher boiling solvents from the product. *US '896* employs Primol 352, a paraffin oil with a boiling point so high in relative terms that the manufacturer (Exxon/Mobil) lists it as "NE" (not established). The PDF of Primol 352 indicates that even at 288°C, only 10% volatilizes, i.e. the boiling point is significantly above this temperature. The Examples of *US '896* appear to indicate that the boiling point is above 350°C, the highest temperature employed. The teachings of *WO '250* would discourage the use of such high boiling, non-polar oils.

*US '896* on the other hand, teaches use of such high boiling oils as necessary, since according to *US '896*, the reaction must take place at temperatures in the range of 300 - 350°C.

*WO '250* does not disclose preparation of amorphous silicon particles, but discloses preparation of silicon-containing clusters of  $\text{Si}_{20}\text{Cl}_{20}$  and  $\text{Si}_{20}(\text{OH})_{20}$ . *US '896*, on the other hand, teaches preparation of amorphous silicon ( $\text{Si}_x$ ).

There does not appear to be any motivation to combine these references. There is certainly no evidence in the record to support the combination, much less the "clear and particular" evidence required by *Dembiczak*. The rejection should be withdrawn for this reason.

However, even if the references were legally combinable, the combination proposed by the Office cannot stand. *US '896* employs  $\text{SiF}_4$  as a reactant, generated from hexafluorosilicic acid ( $\text{H}_2\text{SiF}_6$ ) by reaction with sodium salt to form sodium hexafluorosilicate, which then is heated above 700°C to form the  $\text{SiF}_4$  reactant. The reasons why these reactants are employed is that the fluorosilicic acid is available in large quantities and low cost from phosphoric acid manufacture. See column 3 of *US '896*. To substitute another halosilane would be counter to the aim of *US '896* to produce amorphous silicon at low cost. The use of fluorosilic acid and generation of  $\text{SiF}_4$  are salient features of *US '896*, and any combination of this reference with any other reference must include this salient feature. *Wesslau, id.*

*WO '250*, on the other hand, uses polar solvents, and does not produce amorphous silicon, but rather produces silicon-containing silyl chloride and silyl hydroxide nanoparticles. These are salient features of *WO '250*, and any combination of *WO '250* with any other reference must include these. *Wesslau, id.* However, *US '896* is incompatible with these teachings. The references are physically uncombinable without the "picking and choosing" forbidden by *Wesslau*. Withdrawal of the rejection over the proposed combination of *WO '256* and *US '896* is solicited.

Claim 41 has been rejected under 35 U.S.C. § 103(a) over *WO '250* in view of Kotzsch et al. U.S. 4,044,109 ("*Kotzsch*"). Applicant respectfully traverses this rejection, as claim 28, from which claim 41 depends, is patentable, as discussed above.

It is respectfully noted that Applicant also finds no disclosure or teaching of the requirements of claim 31 (either a) or b)).

Applicant submits that the claims are now in condition for Allowance, and respectfully request a Notice to that effect. If the Examiner believes that further discussion will advance the prosecution of the Application, the Examiner is highly encouraged to telephone Applicant's attorney at the number given below.

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